Hospital "Staffed Beds": A concept in need of clarification

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Overview:

Customarily health planning professionals assess the size of a hospital by using measures such as licensed beds, admissions, patient days, average daily census, and staffed beds. Most measures, with the exception of staffed beds, are clearly defined by statute or by specific administrative, regulatory or reimbursement procedures. "Staffed beds" as a concept, on the contrary, has become a subjective variable that is often left to the hospital's own judgment to access without further guidance. Because hospital size for funding purposes can be measured by staffed beds, and hospitals often have not contemplated the ramifications of inaccurate assessment of this variable, it is important that certain health planning guidelines be established to provide minimum guidance to hospitals.

Historically, health planning endeavors have relied on a probabilistic model comparing the pattern of patient admissions with the normal or Poisson distribution. The object is to estimate at a high level of probability (let us say 98% confidence level) that given an average daily census (ADC) a hospital will ever be required to staff above a certain level. Of course this methodology does not take into account the requirements of major disasters, but neither would the hospital's internal decision process regarding the number of staffed beds. We want to be able to say with high levels of confidence, that a hospital with an ADC of 30 will seldom, if ever, have to staff for more than 43 patients throughout a given year. Given the nature of the probabilistic model, and the assumptions of normal distribution that underlie the model, we would feel more comfortable if we were dealing with a large hospital with an ADC of thousands, but even with small hospitals the estimates can provide guidance into what staffing levels would be required in a "normal" year and a baseline for comparing the actual levels at the end of the year.

Staffed Bed Calculations*:

Because small hospitals often only have general medical/surgical beds and do not have specialty beds (Pediatrics, Obstetrics, Psychiatric, ICU/CCU) the facility can compute the required staffed beds from their "Patient Days" data.

A small rural hospital, for instance with 6,000 patient days would first need to compute its ADC:

$$\text{ADC} = \text{Patient Days}/365 = 6,000/365 = 16.4$$

Under the assumptions of the normal or Poisson distribution the standard deviation equals the square root of the mean.

$$\text{SD} = \sqrt{\text{ADC}} = \sqrt{16.4} = 4.05$$

To determine the Probability Factor (PF) we need only remember that if we go out 1.96 standard deviations from the mean on a normal or Poisson distribution we can capture 95 percent of all measured events. Therefore by multiplying the SD by 1.96 this would provide 95% certainty that you would have enough staff for all but 9 days of the year [(365 - (.95 x 365))/2 = 9. [Note: We must divide by 2 because we are only interested in the positive tail of the normal distribution]. To calculate the staffed beds at the 95% confidence level for medical/surgical beds, therefore:

$$\textbf{ADC + (PF x SD) =16.4 + (1.96 x 4.05) = 16.4 + 7.9 = 24 staffed beds}$$

Likewise, by multiplying SD by 2.33, we would provide 98% certainty that enough staff would be provided for all but 4 days of the year [(365 – (.98 x 365))/2 = 4]. To calculate the staffed beds at the 98% confidence level for medical surgical beds, therefore:

$$\textbf{ADC + (2.33 x SD) =16.4 + (2.33 x 4.05) = 16.4 + 9.4 = 26 staffed beds}$$

Therefore, in general to estimate staffed given that you know the annual patient days and have calculated the ADC of the hospital:

$$\textbf{Staffed Beds = ADC + (PF x } \sqrt{\textbf{ADC}}\textbf{)}$$
$$\textbf{Staffed Beds = ADC + (PF x SD)}$$

Policy implications:

Four caveats must be stated.

(1) the above statistic *does not specify how many staff are required,* but rather it provides an estimate given the number of hospital patient days how many patients, with a high degree of certainty, will be in the hospital on any given day

(2) *the hospital is staffing for the number of patients, not to the maximum number of patients that a given staffing level would allow.* Because of the incremental nature of hospital staffing, once a threshold of patients is reached, the hospital may actually increase the staffing pattern such that many more patients than the estimated number could be taken care of by the hospital. It is the number of patients that the hospital is staffing for, not the number of maximum patients given a staffing pattern.

(3) *staffed beds should reflect normal operations*, not the maximum that could be obtained under extreme emergency.

(4) staffed beds should reflect a *baseline for administrative guidance*, and if experience suggests that the statistical estimates are grossly under or over the number of actually staffed beds then the estimates can be adjusted. Because staffing is a "bottom line" issue hospital administration should be aware if they are in reality overstaffing for the number of patients within their facility.

The computational example given above represents an actual rural hospital in Virginia that had listed its staffed beds as 48 but after the above analysis and several discussions with the CEO and CFO it was determined that they had no idea how to estimate or calculate the number of staffed beds. Of the total of 12 hospitals contacted that had staffed bed estimates considerably higher than that predicted by the model, none of the administrative personnel could point to any institutional or regulatory rule as to a methodology for calculating staffed beds.

For Virginia, the data on staffed beds for all hospitals can be found on the Virginia Health Information website (see: http://www.vhi.org/hospitals.asp). Using the above calculations it can be seen that many hospitals grossly overestimate their actual staffed beds. There is clearly no systematic determination of what constitutes a staffed bed. The analysts at the VHI proffer that it is a very tenuous and ill defined measure and probably should not be used for analytical purposes. It is suggest here that to estimate the actual utilized capacity in Virginia the above formula be consitently used for health planning purposes, as it is already used within the COPN regulations with projected pediatric bed need computation. Namely, the applicant is instructed to:

> Calculate the number of beds needed to assure that adequate bed capacity will exist with a 98% probability for an unscheduled pediatric admission using the following formula: Number of pediatric beds allowable = $PADC + 2.33\sqrt{PADC}$ (12VAC5-240-30. Availability, p. 9)

It would appear that because Virginia is a Certificate of Public Need State (COPN) that many hospitals are reluctant to appear to be drastically underutilizing their current bed capacity. But by inflating staffed beds a false sense of availability of beds may be projected that unrealistically suggests bed utilization.

In addition some hospital administrators may interpret staffed beds to be what they are reporting on their Medicare cost Report** (See Appendix A: Form CMS-2552-96, line #12, column #1). But directions for lines 6 through 11 are simply "Enter the appropriate statistic applicable to each discipline for all programs." "Appropriate" is nowhere defined! "Staffed" is nowhere used in the instructions. Because some federal programs us the cost report data [e.g., for the Small Rural Hospital Improvement Grant Program (CFDA 93.301) small is defined as 49 available beds or less, as reported on the hospital's most recently filed Medicare Cost Report, http://ruralhealth.hrsa.gov/ship.htm] it is important for rural hospitals in this case to know what this addition can entail. Fortunately the SHIP program has made a determination to use staffed beds as the criteria but the methodology for determining staffed beds is nowhere specified.

Conclusion:

Hospital administrators should with do diligence estimate the number of staffed beds that they actually have within their hospital. For health planning and for funding purposes the "staffed bed" criteria remains one of the best indicators of actual usage of hospital beds.

Health planners should probably use the staff bed computations as specified above rather than those numbers proffered by the individual hospitals. For reporting and analytical purposes the estimates provided by state databases such as VHI are particularly unreliable. It may be advantageous for health planning purposes to consistently calculate the "staffed bed" data rather than view such data as a reporting requirement.

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*For a standard treatment of the subject see, Strategic Health Planning: Methods and Techniques Applied to Marketing/Management, Ablex Publishing, Norwood,.NJ, (January 1, 1991, 1998) p. 74.

**FORM CMS-2552-963605.1   Part I - Hospital and Hospital Health Care Complex Statistical Data.--This part collects statistical data regarding beds, days, FTEs, and discharges.

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APPENDIX A

HOSPITAL AND HOSPITAL HEALTH CARE COMPLEX STATISTICAL DATA	PROVIDER NO.: _____	PERIOD FROM _____ TO _____	WORKSHEET S-3, PART I

Component	I/P Days / O/P Visits / Trips						Interns & Residents FTEs			Full Time Equivalent		Discharges				
	No. of Beds	Bed Days Available	Title V	Title XVIII	Title XIX	Total All Patients	Total	Less I & R Replacing Non-Phys. Anesthetists	Net	Employees On Payroll	Nonpaid Workers	Title V	Title XVIII	Title XIX	Total All Patients	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1 Hospital Adults & Peds. (columns 3, 4, and 5), exclude Swing Bed, Observation Bed, and Hospice Days.	X	X	X	X	X	X						X	X	X	X	1
2 HMO				X	X											2
3 Hospital Adults & Peds. Swing Bed SNF			X	X	X	X										3
4 Hospital Adults & Peds. Swing Bed NF			X		X	X										4
5 Total Adults and Peds. (exclude observation beds) (see instructions)	X	X	X	X	X	X										5
6 Intensive Care Unit	X	X	X	X	X	X										6
7 Coronary Care Unit	X	X	X	X	X	X										7
8 Burn Intensive Care Unit	X	X	X	X	X	X										8
9 Surgical Intensive Care Unit	X	X	X	X	X	X										9
10 Other Special Care	X	X	X	X	X	X										10
11 Nursery			X		X	X										11
12 Total (see instructions)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	12
13 RPCH\CAH visits			X	X	X	X	X	X	X	X	X					13
14 Subprovider	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
15 Skilled Nursing Facility	X	X	X	X	X	X	X	X	X	X	X					15
16 Nursing Facility	X	X	X		X	X	X	X	X	X	X					16
17 Other Long Term Care	X	X				X	X	X	X	X	X				X	17
18 Home Health Agency			X	X	X	X	X	X	X	X	X					18
20 ASC (Distinct Part)																20
21 Hospice (Distinct Part)	X	X		X	X	X	X	X	X	X	X					21
23 Outpatient Rehab. Provider (specify)			X	X	X	X	X	X	X	X	X					23
24 RHC/FQHC (specify)			X	X	X	X	X	X	X	X	X					24
25 Total (sum of lines 12-24)	X	X														25
26 Observation Bed Days							X	X	X	X	X					26
27 Ambulance Trips				X												27
28 Employee discount days (see instru.)							X	X	X	X	X					28

FORM CMS-2552-96 (8/2002) (INSTRUCTIONS FOR THIS WORKSHEET ARE PUBLISHED IN CMS PUB. 15-II, SECTION 3605.1)